

REMARKS

The Examiner has required an election in the present application among:

Group 1, claims 1-12, drawn to prepolymer and prepolymer composition;

Group 2, claims 13-14, drawn to high molecular weight polymer and a dielectric film;

and

Group 3, claim 14, drawn to a method of producing a dielectric film.

For the purpose of examination of the present application, Applicants elect, with traverse, Group 1, claims 1-12, drawn to prepolymer and prepolymer composition.

The Examiner then required an election of the species as recited in claims 6, 7, or 8.

For the purpose of examination of the present application, Applicants elect the prepolymer of claim 8 with traverse.

Applicants respectfully traverse the restriction requirement. An object of the present invention is to provide high-molecular-weight polymers and dielectric films which have high heat resistance and low relative dielectric constants and are useful for the production of semiconductors, and production methods of them, prepolymers and prepolymer compositions that can form these polymers and dielectric films.

Another object of the present invention is to provide prepolymers and prepolymer compositions that can easily form thin films having necessary thicknesses as interlayer dielectric films and to provide high-molecular-weight polymers and dielectric films formed from these prepolymers and prepolymer compositions.

Yet another object of the present invention is to provide high-molecular-weight polymers and dielectric films that are highly crosslinked and highly porous and to provide prepolymers and prepolymer compositions that can form these polymers and dielectric films.

After intensive investigations to achieve the above objects, the present inventors have found that a dielectric film having a very low relative dielectric constant and a desired thickness can be easily obtained by carrying out the production of a high-molecular-weight polymer with a porous structure in two processes, specifically, by preparing a prepolymer easily soluble in a solvent in advance, and converting the prepolymer into a high-molecular-weight polymer typically by heat treatment. More specifically, they have found that a dielectric film comprising a high-molecular-weight polymer with a porous structure having high heat resistance, high mechanical strength, and a very low relative dielectric constant can be obtained by reacting two compounds under suitable conditions to yield a prepolymer as a precursor of the high-molecular-weight polymer, which two compounds are capable of undergoing polymerization to form a high-molecular-weight polymer with a porous structure as a result of a reaction between their functional groups; dissolving the prepolymer in an appropriate solvent; applying the solution onto a base material; and subjecting the applied film typically to heat treatment to allow reactions such as chain extension, cyclization, and crosslinking to proceed smoothly to thereby form pores reliably. They also have found that the prepolymer is excellent in solubility in a solvent and can thereby easily yield a thin film having a necessary thickness as interlayer dielectric films. The present invention has been achieved based on these findings.

Specifically, the present invention provides *a prepolymer as a reaction product between a compound A and a compound B*, the compound A and the compound B each having two or more functional groups or sets of functional groups in one molecule, and *the compound A and the compound B being capable of undergoing polymerization* as a result of binding of the functional groups or sets of functional groups of one compound with the functional groups or sets of functional groups of the other compound *to thereby form a high-molecular-weight polymer with a porous structure* (see pages 3-6 of the present specification).

On the other hand, JP 2001-332543 teaches *the mixed solution* containing the first cross-linking molecules having a three-dimensional structure and second cross-linking molecules having a two-dimensional structure (Example 1 of JP 2001-332543) and teaches *an interlayer dielectric film* comprising a three-dimensionally polymerized polymer having a number of molecular level pores inside, formed by polymerizing first cross-linking molecules having a three-dimensional structure and second cross-linking molecules having a two-dimensional structure (claim 1 of JP 2001-332543).

However, JP 2001-332543 does **not** disclose *the prepolymer as a reaction product between a compound A and a compound B*, the compound A and the compound B each having two or more functional groups or sets of functional groups in one molecule, and *the compound A and the compound B being capable of undergoing polymerization* as a result of binding of the functional groups or sets of functional groups of one compound with the functional groups or sets of functional groups of the other compound *to thereby form a high-molecular-weight polymer with a porous structure*.

Therefore, *the prepolymer* of claim1 is novel and has an inventive step and defines a special technical feature distinguishing the claimed invention over the prior art.

Accordingly, the inventions listed as Groups 1-3 relate to a single general inventive concept, and they have the same or corresponding special technical feature.

If the restriction requirement is not removed, Applicants respectfully remind the Examiner that should all the claims directed to the elected invention be in condition for allowance, the nonelected claims should be considered for rejoinder. (See MPEP 821.04(b)). Similarly, should the Examiner not find prior art, which renders the elected species unpatentable, the Examiner is required to expand the search to include a reasonable number of additional species. (See MPEP 809.02).

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Chad M. Rink, Registration No. 58,258 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

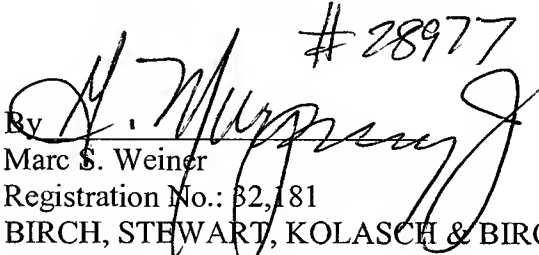
- ☐ Attached is a Petition for Extension of Time.
- ☐ Attached hereto is the fee transmittal listing the required fees.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to our Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. § 1.16 or under § 1.17; particularly, extension of time fees.

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Respectfully submitted,



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